



Smarter Irrigation for Profit

Advanced data-driven irrigation



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Roadmap!

- Smarter irrigation project context
- The power of data to inform decisions
- Current practice and the cost of getting it wrong
- Variable rate irrigation
- VARlwise autonomous control platform

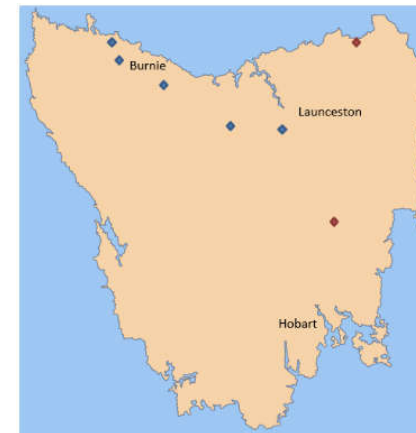


Project 2b – Smart Automated irrigation

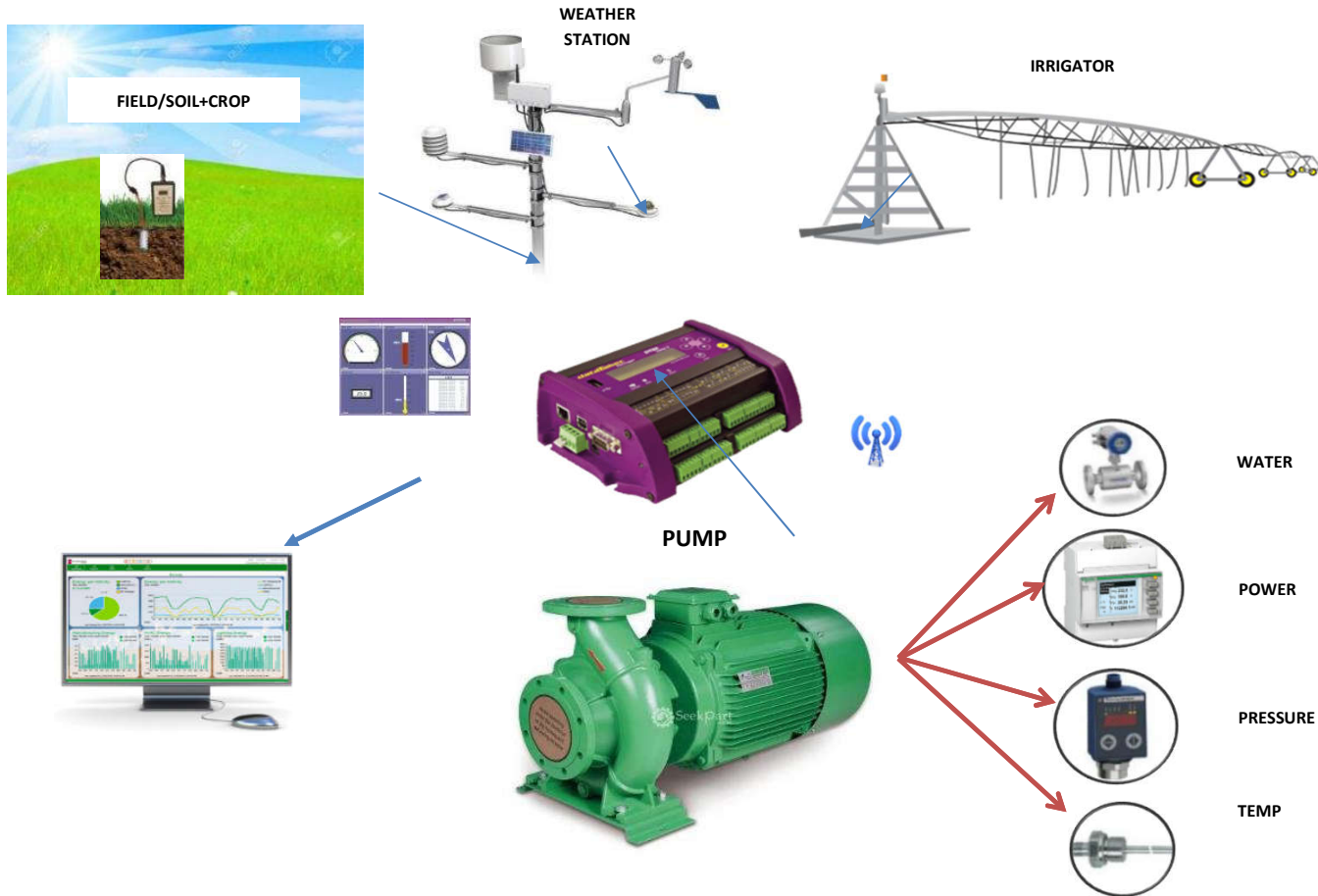
- Increasing farm profit through efficient use of irrigation input to dairy pastures

– Five Farmer sites

- 4 with human interface
- 1 with Automation (VARIfwise)
- Year 1 – collect data only
- Year 2 – provide information
- Year 3 – Interact with the farmers

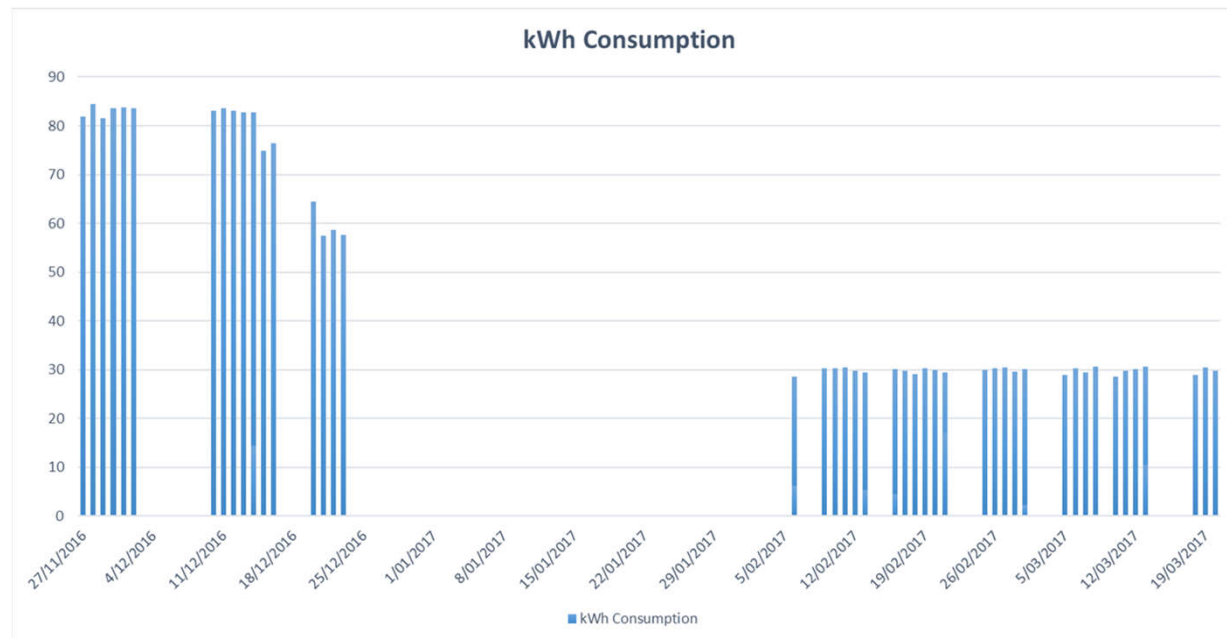


The power of data (information)



Powerful Impact

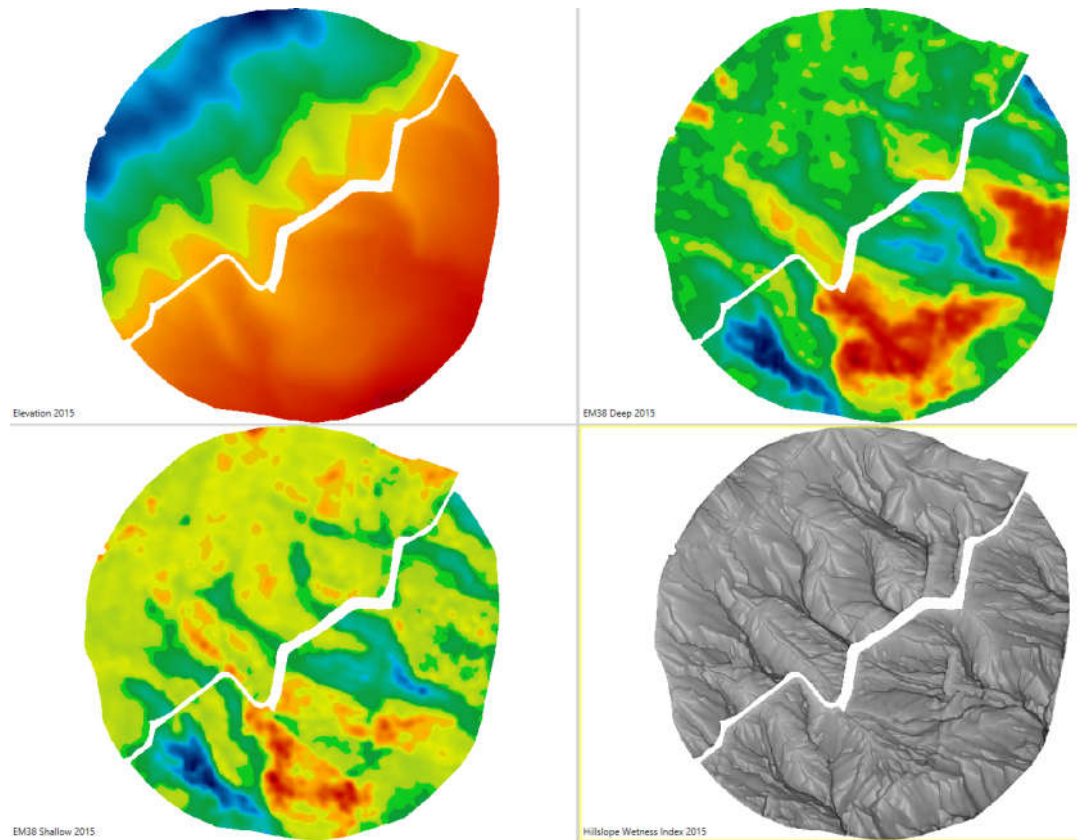
- Measured results before and after pump and motor replaced
- 787 kWh/ML vs 266 kWh/ML
- Savings of \$120/ML or more than \$15,000 for the season



Cressy Pivot



Site variability maps



Site	Total stored water to 1.0 m (mm)	Total stored water in 30 cm root zone (mm)	Readily available water in 30 cm root zone (mm)
Cressy A	476	35	19

Roots

40 cm

30 cm

15 cm

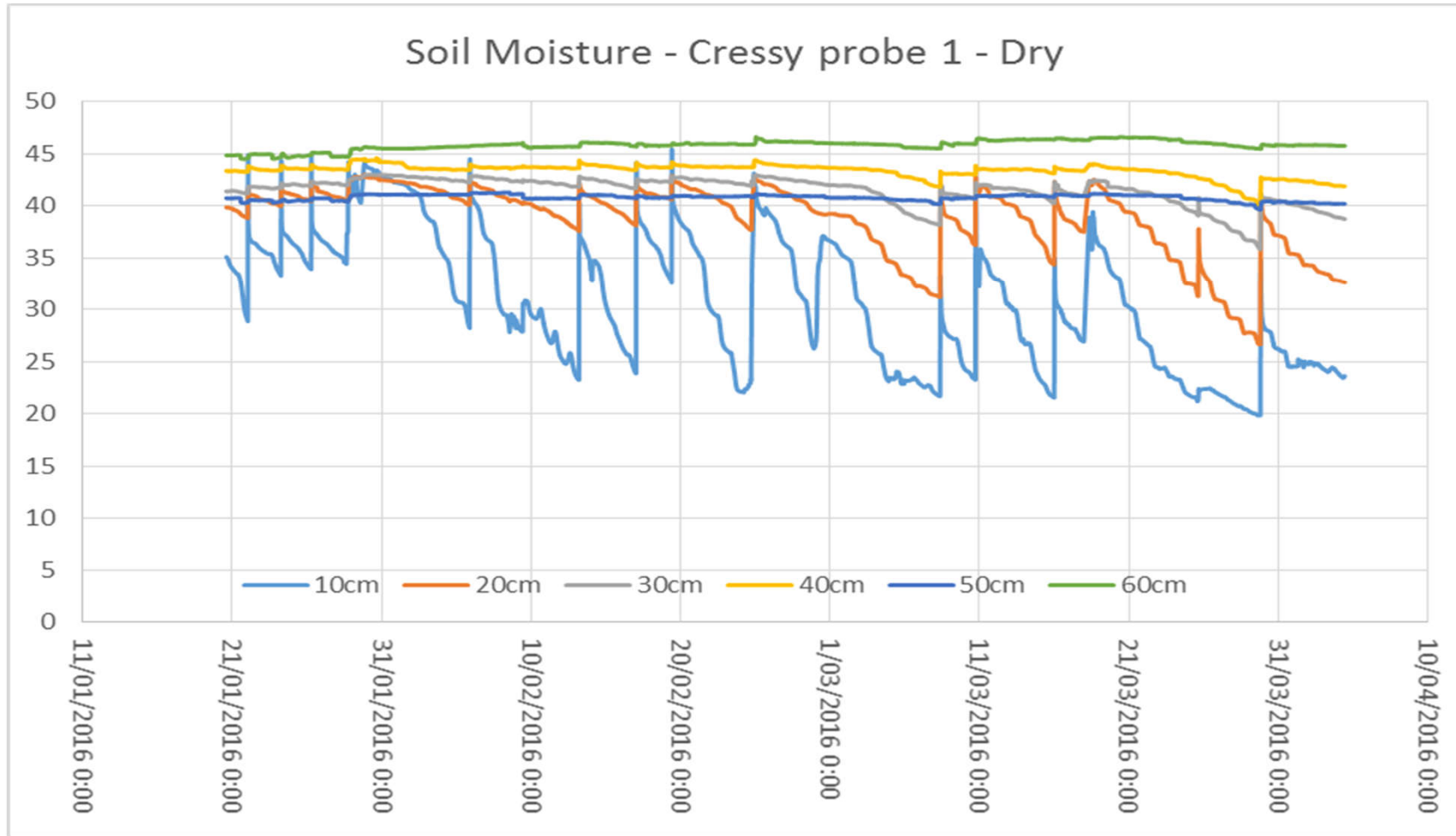


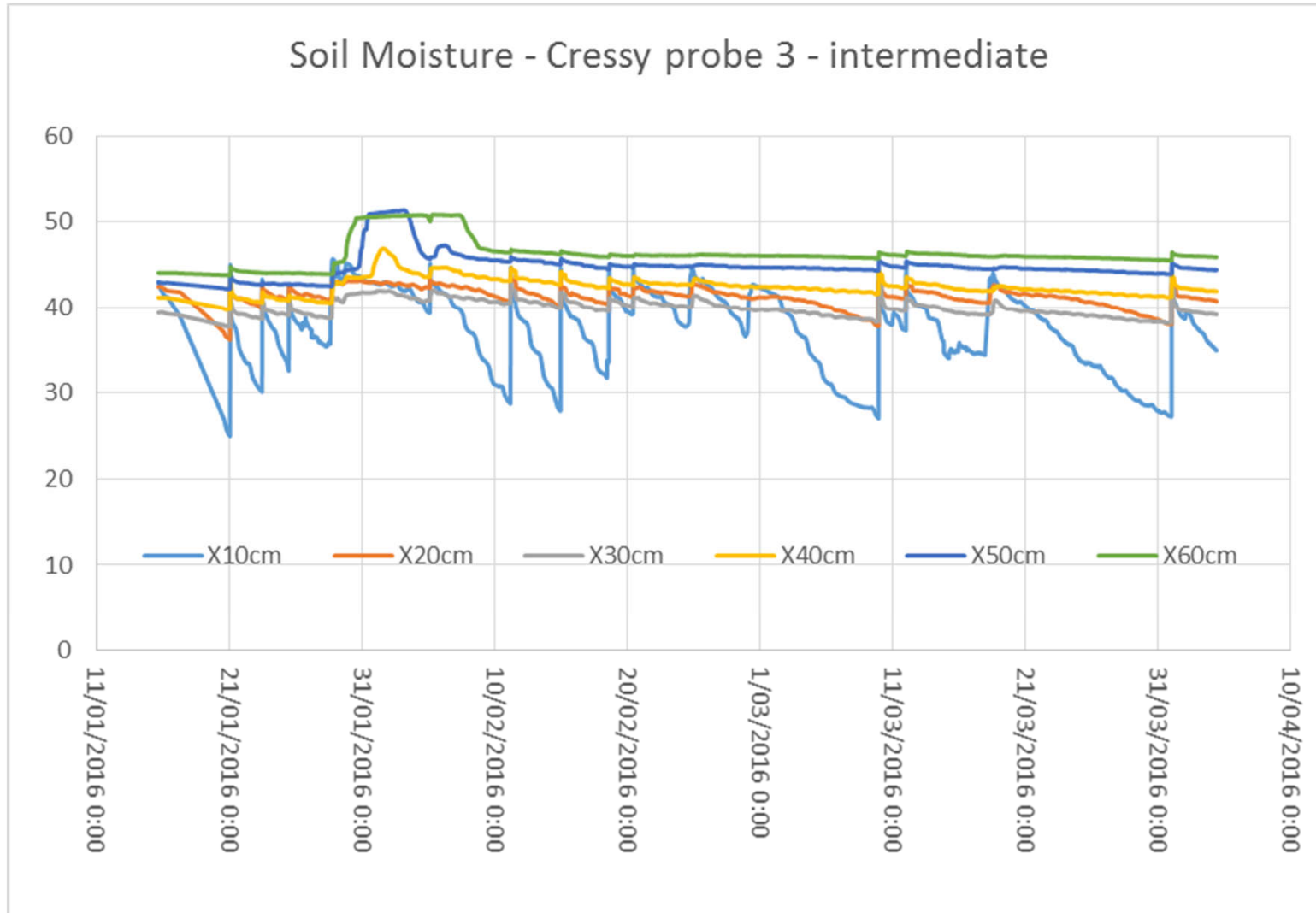
RAW

25mm

19 mm

9.5 mm





Site summary

- Large highly variable site
- Issues with wet areas and bogging
- System capacity – 6.7mm/d
- RAW varies between 9 and 25 mm
- ETo – maximum 7mm in January

- Continuous irrigation required during mid summer and variable rate application could be beneficial

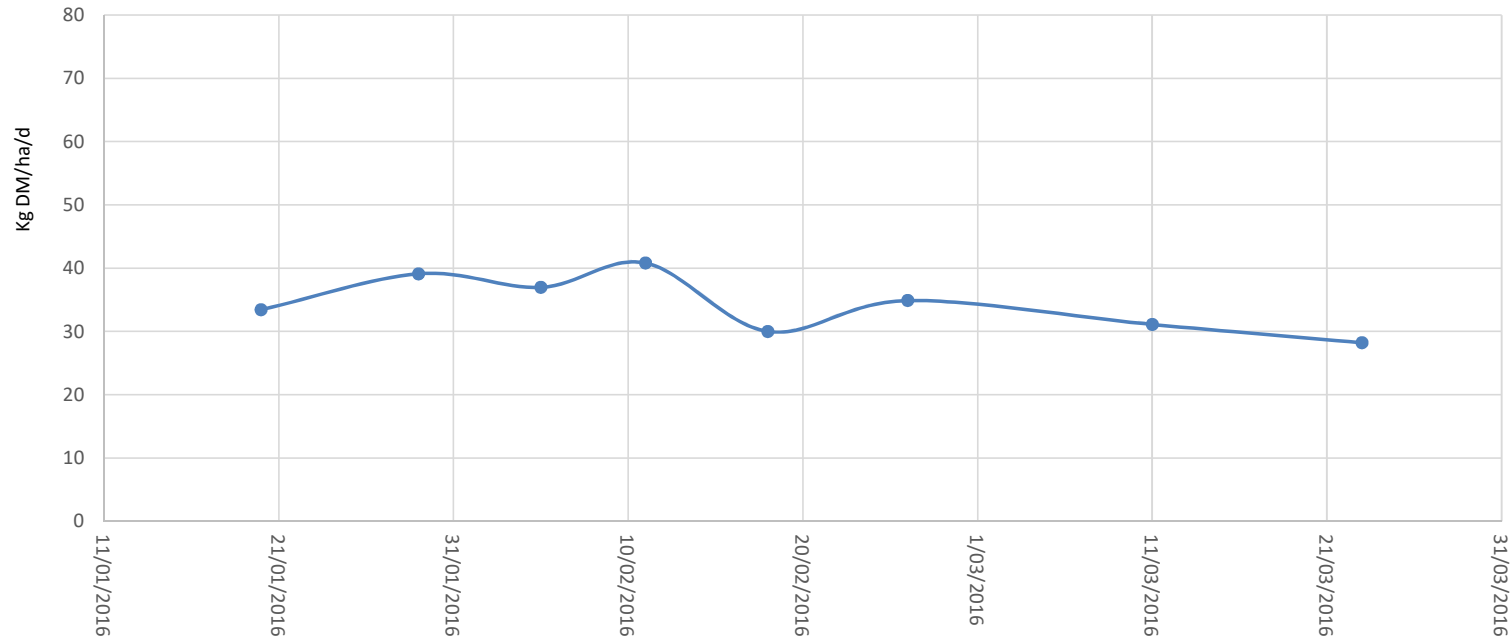
Irrigation scheduling and crop growth at Cressy from 2016 to 2018



Pasture growth rates 2016

Cressy 15/16

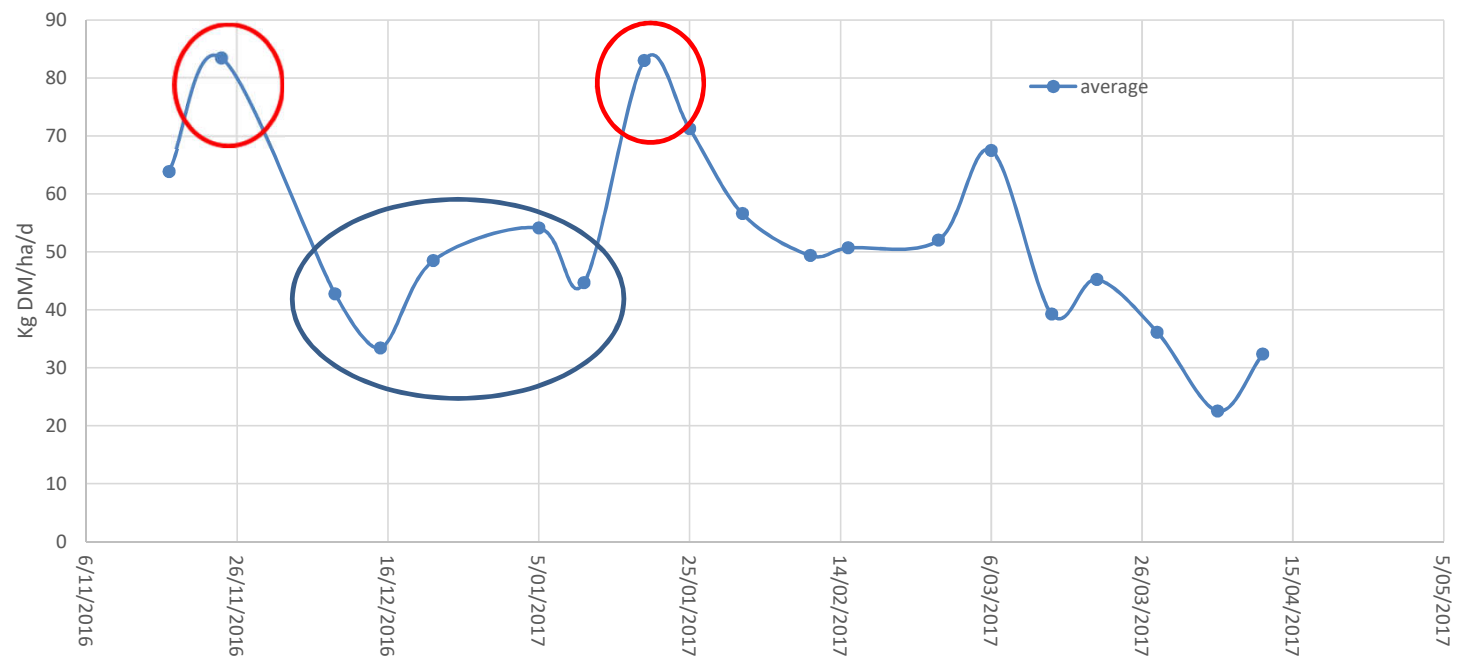
6.2 ML/Ha



Pasture growth rates 16/17

Cressy

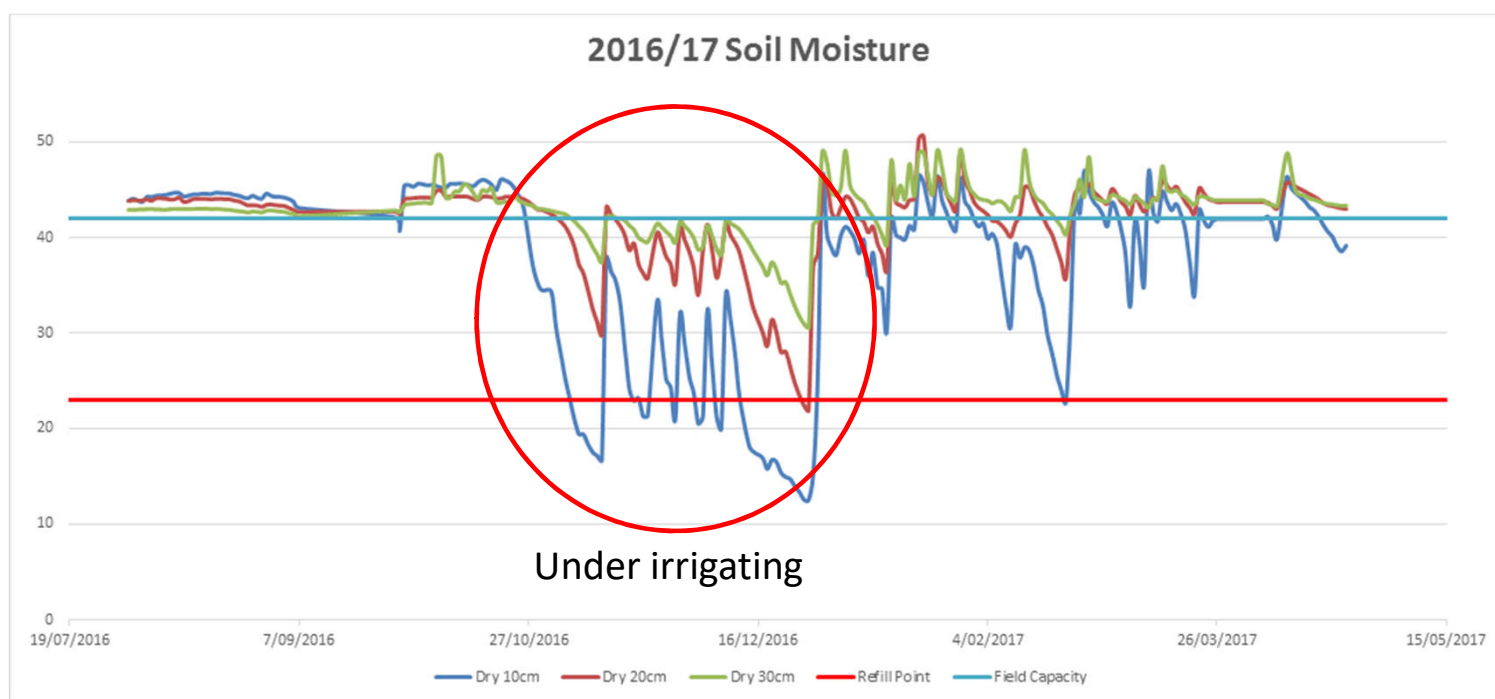
4.1 ML/ha



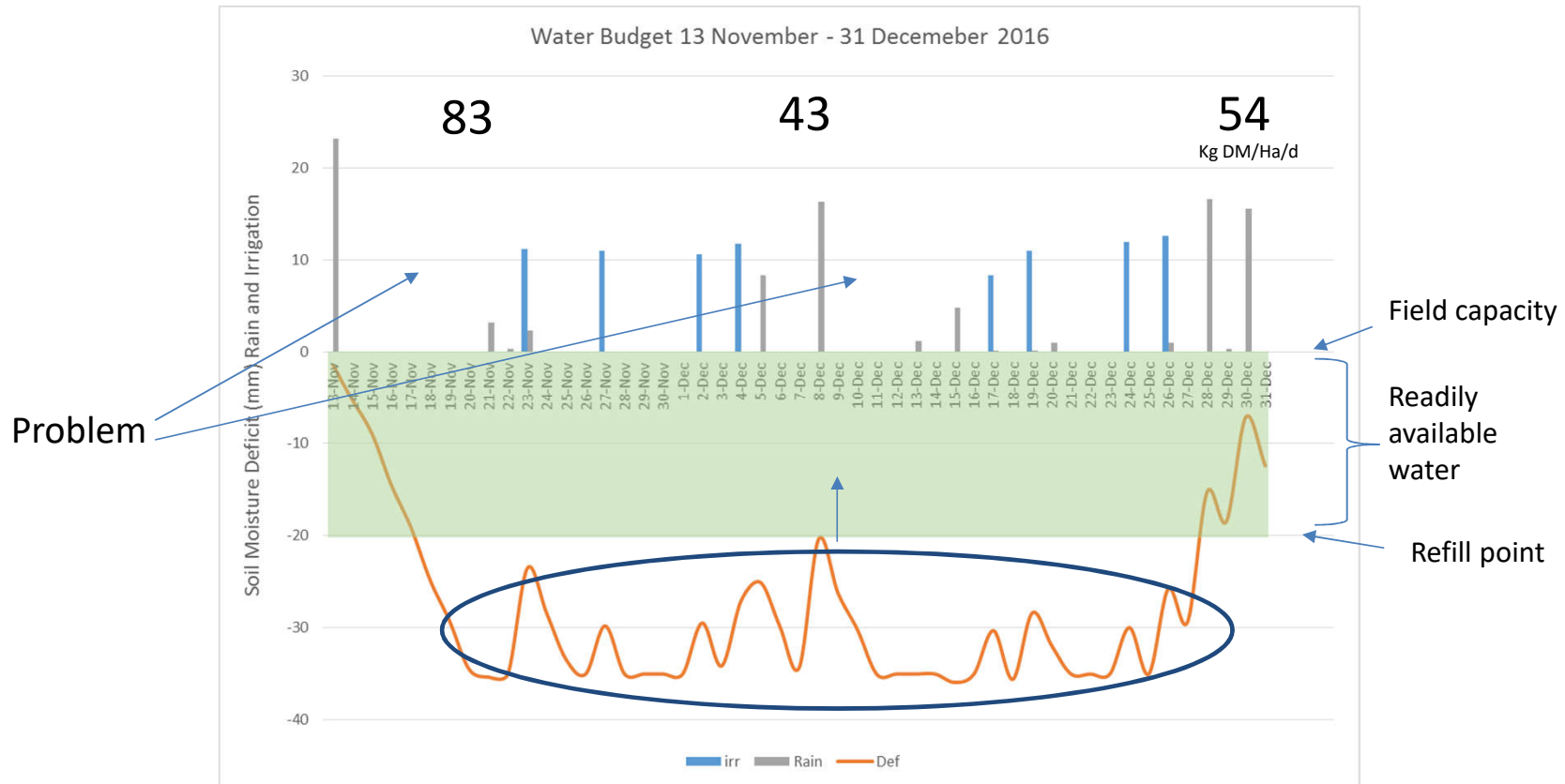
Cutting silage

Grazing management

2016/17 Soil moisture



The Green Drought

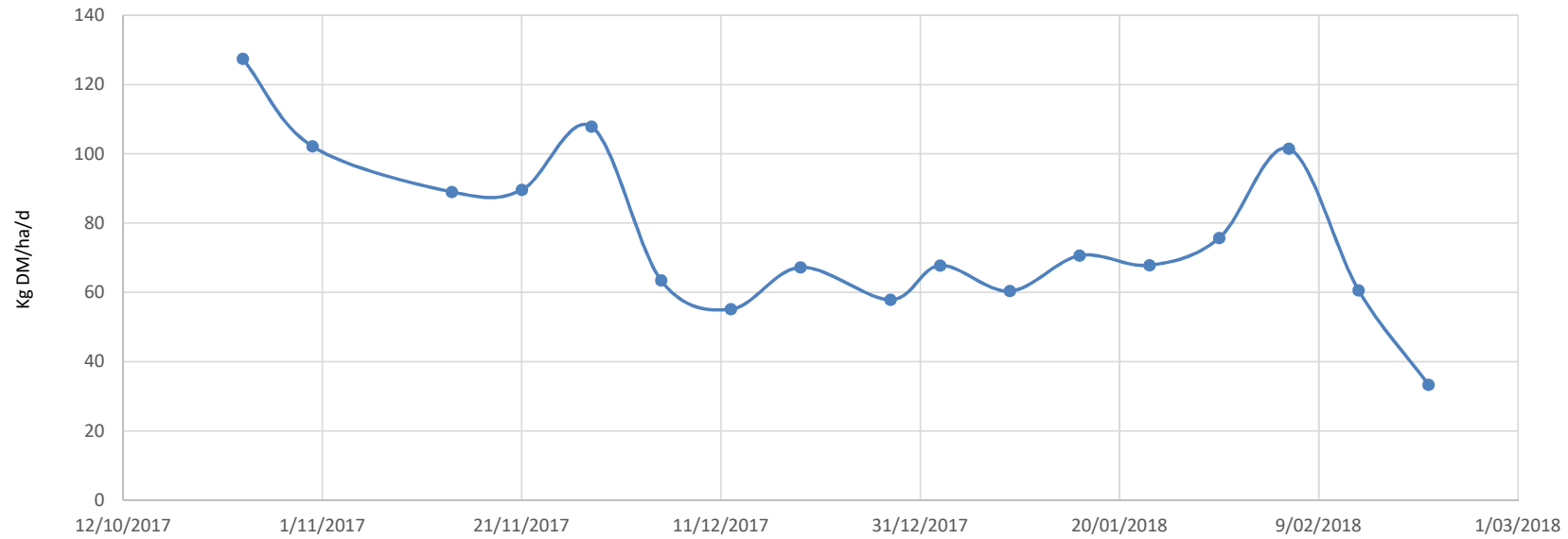


ETc 4.3mm Rain and irrigation - 198mm required 191mm received

Pasture growth rates 17/18

Chart Title

4.6 ML/Ha



The opportunity cost in year 1

Year Oct - Mar	Average growth rate kg/ha/d	Pasture growth t DM/ha	Irrigation ML/ha	Rain mm	GPWUI T DM/ML
15/16	34*	6.2	6.2	215	0.74
16/17	54	9.8	4.1	319	1.34
17/18	69	12.4	5.1	203	1.65

*Only measured from January 2016

- Opportunity loss of approximately 35kg DM/ha/d
- Opportunity loss of 420t pasture over 3 months for 117 ha pivot
- \$200/t extra feed cost for purchased feed to fill the gap
- Over \$80000 extra cost over 3 months

Summary

- The power of data – measure to manage
- Beware of the Green Drought
- Keeping the bucket topped up is key!!!
- Poor watering costs production and money

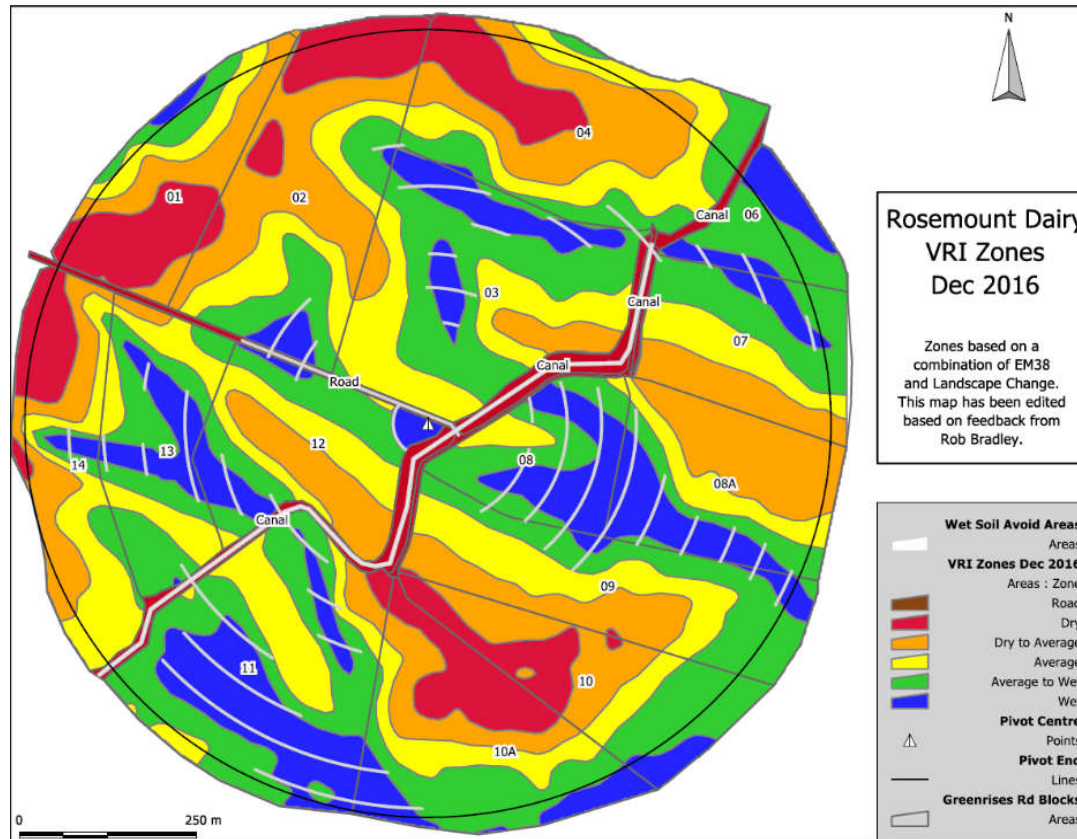
Variable rate irrigation

- Why variable rate irrigation?
- To manage variability due to
 - Management and infrastructure
 - laneways
 - Locking up paddocks for silage
 - Renovation of specific paddocks
 - Different crops under 1 pivot
 - Climate and temporal change
 - Soils and topography



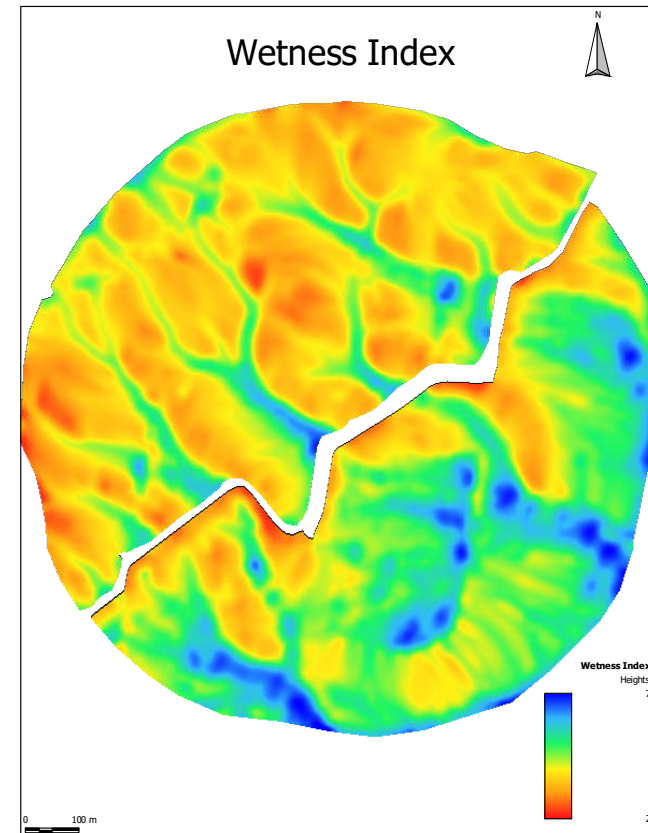
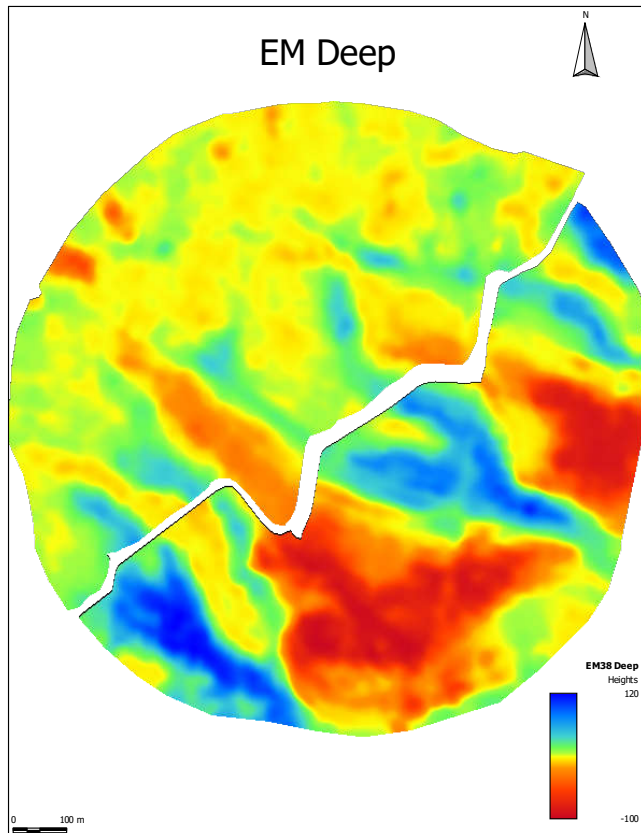
Cressy

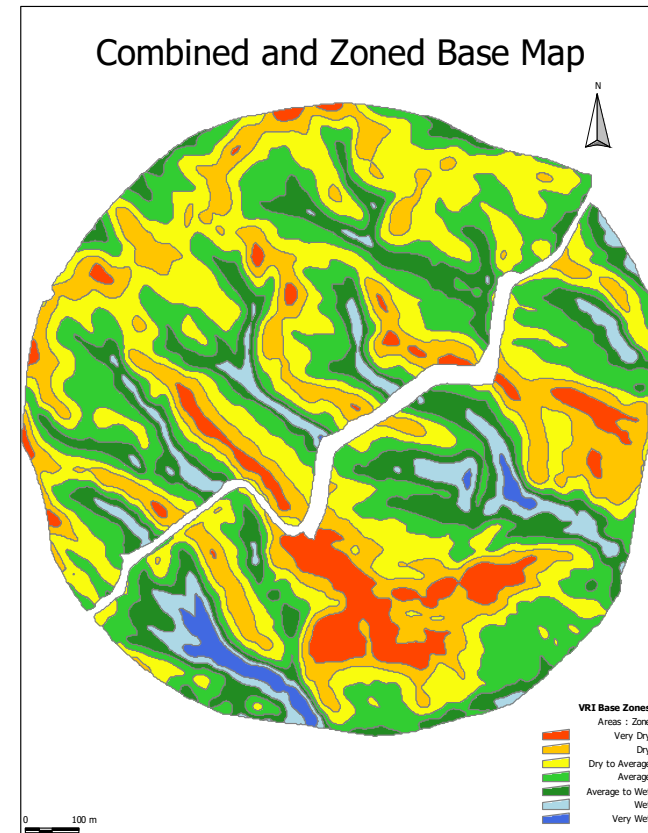
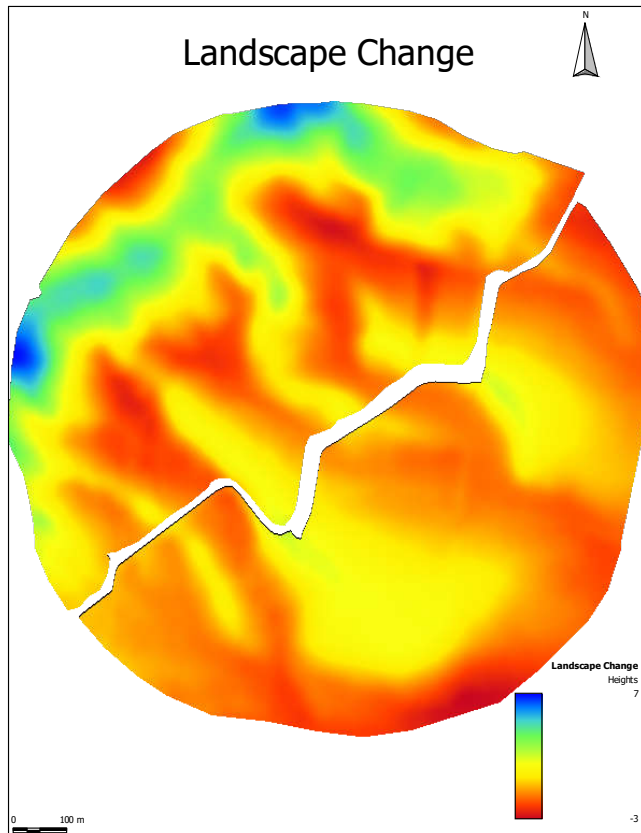
34% reduction
in irrigation
2ML/ha

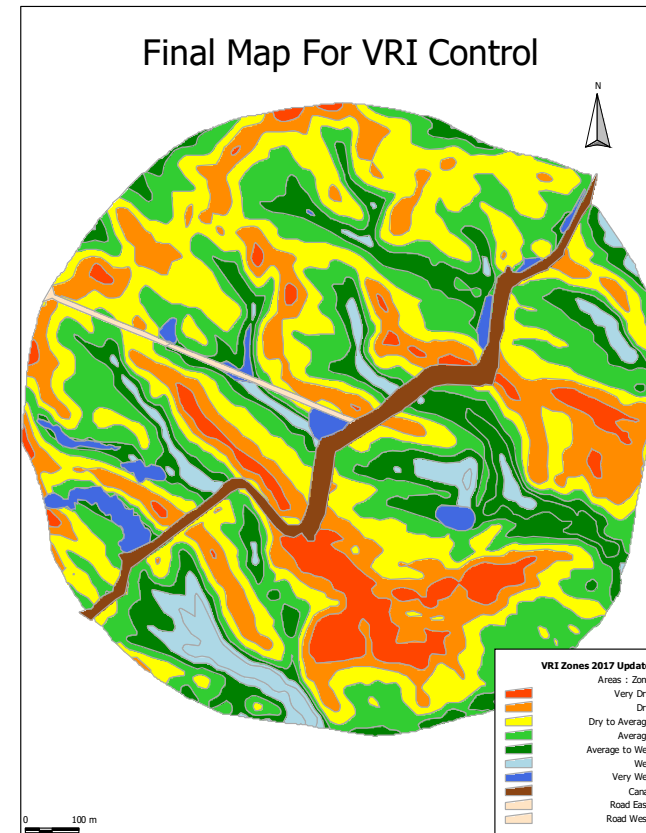
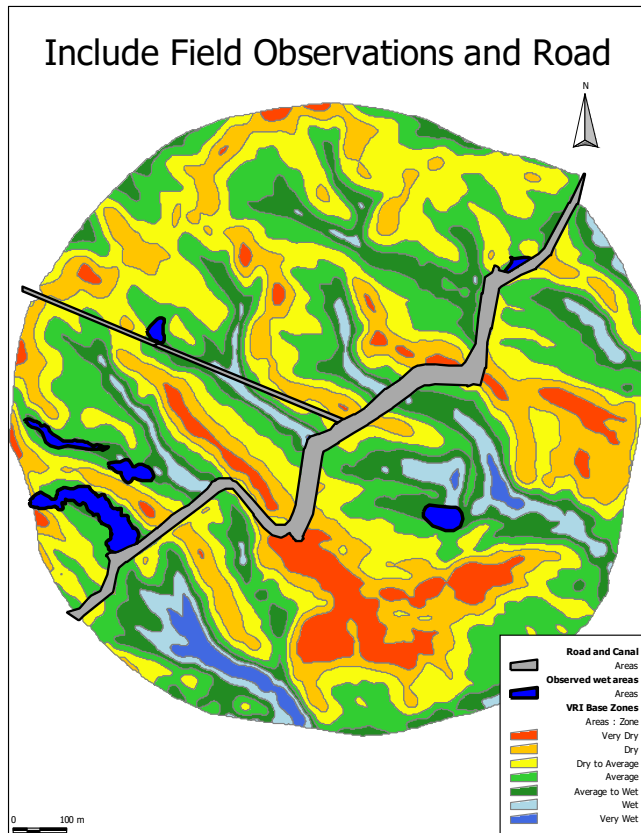


Reuben Wells - AgLogic

Producing a base prescription map











Rob Bradley *stated that “We’re putting the water where it needs to go, we’re using less power to do it, and we’re growing more grass”.*

NCEA and Automation with VARIwise

Developing variable-rate irrigation prescription maps from:

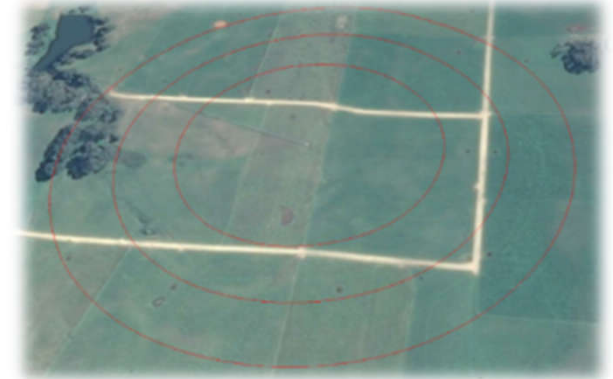
- (i) infield weather, soil, and pasture growth sensors
- (ii) optimisation algorithms using calibrated crop production models in 'VARIwise' software
- (iii) automated prescription map upload



Cameras on Pivots

- Pasture height used for irrigation
- Height is measured using quad bike sensor
- Smartphone-based cameras on pivot upload image and location

Location of 3 cameras on pivot:



Smartphone pasture sensor:



Height = 46mm

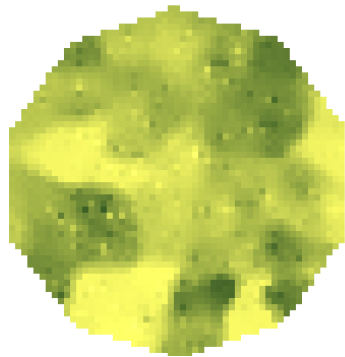


Height = 86mm

Automated irrigation for dairy pastures

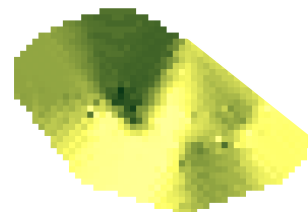
- Image analysis extracts pasture features in camera image
- Compared with weekly quadbike height data

Height from quad
bike sensor

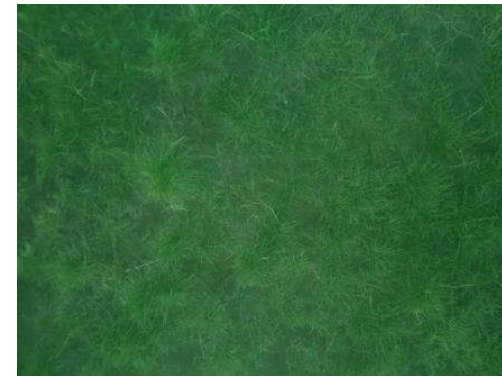


Canopy cover
from cameras

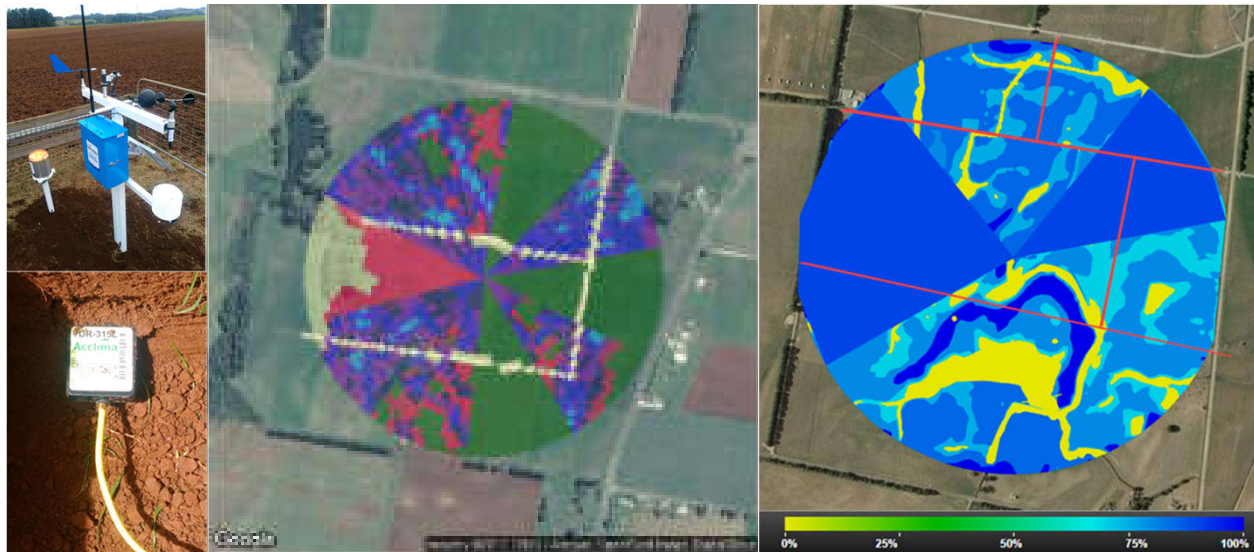
0 Height (mm) 250



Collected images from
cameras



Automated prescription map comparisons



10-20 % reduction in water use compared with flat rate applications

Acknowledgements

David McLaren, TIA
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